

## REMARKS

Claims 1-88 have now been canceled and replaced by new claims 89-337. Certain of the cancelled claims have been rejected as anticipated by or obvious in view of U.S. Patent No. 5,608,526 to Piwonka-Corle et al. To the extent that the rejection is deemed also applicable to the new claims added, the rejection is respectfully traversed.

As amended, claim 89 now requires that no substantial relative change in polarization state between the radiation and the sample beam is caused by relative motion between optical elements employed into focusing, collecting and analyzing. This is radically different from the system in the '526 patent. Before this rejection is discussed in detail, it is worthwhile to first contrast the overall configuration of the method of claim 89 to that of the '526 patent.

The '526 patent discloses a spectroscopic ellipsometer, where an illumination beam is focused by means of optics having a small numerical aperture to a small spot on the surface of the sample and at an oblique angle. The illumination beam essentially has a unique polarization state (e.g. column 7, line 33), and a change in the unique polarization state caused by interaction with a sample in the specular reflection beam is detected to detect the ellipsometric parameters in order to determine the thicknesses and indices of refraction of layers of the sample. In order to detect the change in polarization state caused by interaction with the layers of the sample, the system of the '526 patent requires relative rotation motion between the polarizer and analyzer. By analyzing the change in intensity of the reflected beam through at least a whole revolution in the relative rotation between the polarizer and analyzer, enough information may then be obtained over a broad wavelength spectrum to determine the thicknesses and indices of refraction of multiple layers of the sample.

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In contrast, the method of amended claim 89 focuses a polarized sample beam of broadband radiation to the sample where the sample beam has a multitude of polarization states. Interaction of the sample beam with the sample causes changes in the multitude of polarization states. Radiation modified by the sample is collected and analyzed and dispersed to provide a polarimetric spectrum containing information of the modified polarization states for determining information on properties of the sample.

One difference between new claim 89 and the '526 patent is that the illumination polarized sample beam has a multitude of polarization states. By detecting the changes in the multitude of polarization states caused by the sample, adequate information may be obtained for determining the properties of the sample. In the '526 patent, on the other hand, it is generally undesirable for there to be a multitude of polarization states, although with a small numerical aperture and entrance slit (60 x 500 microns), there may be some slight variation in the polarization state of the sampling beam in the '526 patent. In order for the system of the '526 patent to be able to obtain enough information for determining properties of the sample, there must be relative rotation between the polarizer and analyzer. In contrast, in the method of claim 89, there is no relative motion required between any components, including any relative motion between a polarizer and analyzer that may be used in the method. Thus, the key difference is that in the method of new claim 89, no substantial relative change in polarization state between the radiation collected and analyzed and the sample beam is caused by relative motion between optical elements that are employed to focus the sample beam, to collect radiation modified by the sample and to analyze the radiation. In contrast, in the system of the '526 patent, such relative change in polarization state is crucial for the determination of information on properties of the sample.

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In the Office Action, the Examiner appears to believe that the '526 patent also teaches a configuration where the polarizer and analyzer do not rotate, as apparent from the rejection of claim 7. Applicants respectfully disagree. In the rejection of claim 7, the Examiner refers to column 9, lines 50-60 and column 13, lines 30-35 of the '526 patent. Applicants respectfully submit that these sections of the '526 patent in no way teaches or suggests the above-described key feature of new claim 89. If the Examiner disagrees, it is respectfully requested that the Examiner set forth in detail why he believes that the sections of the '526 patent referred to, or any other part of such patent, teaches or suggests such feature.

The above-described detection scheme of new claim 89 is radically different from the '526 patent. Thus in new claim 89, no moving parts are required, although it is possible to include rotating or otherwise moving optical elements in the path of the sample beam or the collected radiation, where no substantial relative change in polarization state between the radiation and the sample beam is caused by relative motion between such elements or between such elements and other stationary elements employed. In other words, the method of new claim 89 does not rely on the change in polarization state caused by relative motion for determining properties of the sample. This is advantageous over the system of the '526 patent, since the method of claim 89 requires no moving parts and is simpler to implement. Enough information is obtained by detecting changes in the multitude of polarization states in order to determine properties of the sample for many applications. For this reason, it is also believed that claim 89 is non-obvious over the '526 patent.

Claims 90-106 are believed to be allowable since they depend from allowable claim 89. They are further believed to be allowable on account of the features added therein. Thus, claim 92 adds the feature of a wavelength range of the sample beam from 190 to 830 nm. The '526 patent discloses a different wavelength range of 230 to 850 nm (column 5, lines 64).

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Claim 95 adds the limitation that the sample beam is obtained by passing a beam of radiation through a polarizer and that the analyzing is performed by means of an analyzer and where the polarizer and analyzer do not rotate during the focusing and analyzing. As noted above, this is not taught or suggested by the '526 patent. Claim 96 adds the limitation that the polarization states are functions of an angle  $\phi$  to a reference plane normal to a sample surface and that the angle  $\phi$  has a range defining a substantial angle of an illumination aperture. In order for adequate information to be obtained for determining properties of the sample, it is preferable for the multitude of polarization states to be spread over a substantial angle in reference to a reference plane as in claim 9, such as the plane of polarization of the polarizer  $\phi_p$ . This is contrary to the design of the system in the '526 patent. In the system of the '526 patent, it is desirable for the illuminating sample beam to have a unique polarization state rather than a multitude of polarization states. Since any illumination beam must have at least a small numerical aperture, there will be a small variation in the polarization state in the sample beam. In spectroscopic ellipsometry, this is taken into account in the modeling as one of the parameters that must be solved for. For design purposes, it is desirable for such variation in polarization state to be as small as possible in the system of the '526 patent and it is, therefore, undesirable for the polarization state to spread over a substantial angle of an illumination aperture. Claim 97 adds the limitation that the angle of the illumination aperture over which the multitude of polarization states is spread is about 90 or 180 degrees which is clearly much larger than anything that is used or has reason to use in the '526 patent, for reasons given above.

In the Office Action, the Examiner is of the opinion that column 7, lines 28-40 and 55-60 disclose the limitations of claims 96 and 97 in the subject application. Applicants respectfully disagree. The referenced sections of the '526 patent in column 7 refer to an

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entrance slit in member 2 of 60 microns by 500 microns. However, nowhere does the '526 patent disclose an illumination aperture of a substantial angle, such as one as large as 90 or 180 degrees.

Claim 98 adds to claim 89 the limitation that a common objective is used for focusing and collecting. Column 6, lines 9-11 of the '526 patent cited by the examiner to reject this claim refers to a pattern recognition system for focusing or pattern recognition and not one for measuring a polarimetric spectrum for the purpose of determining properties of the sample.

Claim 99 adds the limitation that the sample has different optically detectable properties along at least two axes wherein the focusing or collecting employs an aperture centered about one of the axes. Column 8, lines 33-40 of the '526 patent does not teach or suggest such feature. This section contains no disclosure concerning any anisotropic properties of the sample or how the aperture should be located with respect to any axis of anisotropy.

The same can be said for claim 100. Column 9, lines 28-45 of the '526 patent, contains no disclosure concerning optically detectable properties along two axes of the sample or how any aperture should be located in reference to these axes. The same is true for claim 101. If the Examiner disagrees, it is respectfully requested that the Examiner set forth in detail how such quoted sections teach or suggest the features of claims 98-101. As to claim 103, column 5, lines 62-65 of the '526 patent teaches a wavelength range of 230 to 800 nm, not the claimed wavelength range. Claim 105 adds the limitation of altering phase of the radiation modified by and collected from the sample prior to analyzing and dispersing it. Column 10, lines 60-65 or any other part of '526 patent simply contains no disclosure of intentionally altering the phase of the radiation modified by and collected from the sample

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prior to analyzing. If the Examiner disagrees, he is requested to explain in detail why he believes that this section of the '526 patent reads on claim 105.

To the extent the rejection applied to cancelled claims 18, 26, 45 is deemed to apply to claims 106, 123 and 45 under 35 U.S.C. § 103(a) as being obvious over the '526 patent, the rejection is respectfully traversed.

Claim 106 adds to claim 105 the limitation that he altering the retards the phase of the modified and collected radiation by about  $\pi/4$ . Claim 105 adds the limitation of altering phase of the radiation modified by and collected from the sample prior to analyzing and dispersing it. As noted above, the '526 patent simply contains no disclosure of intentionally altering the phase of the radiation modified by and collected from the sample prior to analyzing.

Therefore, the Examiner's statement that "where the general conditions of a claim are met" fails. If the Examiner disagrees, it is respectfully requested that the relevant section of the '526 patent be pointed out that teaches or suggests such feature. As noted above, column 10, lines 60-65 contain no disclosure of placing a phase modulator in front of the analyzer.

For substantially the same reasons as those explained above, claims 116-128, 131-133 and 138-141 are also believed to be allowable.

Cancelled claims 47-63 are rejected under 35 U.S.C. § 101 as claiming the same invention as that of claims 49-65 of prior U.S. Patent No. 6,184,984. Claims 47-63 have been cancelled. New claims 89-337 added do not claim the same invention as that of the claims of prior U.S. Patent No. 6,184,984. Under MPEP 804, a reliable test for double patenting under 35 U.S.C. § 101 is whether a claim in the application could be literally infringed without literally infringing a corresponding claim in the patent, citing *In re Vogel*, 422 F.2d 438, 164

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U.S.P.Q. 619 (CCPA 1970). It is believed that under this test, new claims 89-337 do not claim the same invention as that of the claims of prior U.S. Patent No. 6,184,984.

Cancelled claims 1-46 and 64-88 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over certain claims of U.S. Patent No. 6,184,984. Attached is a terminal disclaimer referring to U.S. Patent No. 6,184,984. On account of the terminal disclaimer, the judicially created doctrine of obviousness-type double patenting is believed to have been overcome.

New claims have been added to more completely cover the invention.

Claims 89-337 are presently pending in the application. Reconsideration of the rejections and an early indication of the allowability of all the claims standing are earnestly solicited.

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